

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	11	((keystroke)near(dynamics or latenc\$4))(password or PIN)(two or second)near(character or input or entry or keystroke)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 18:06
L2	274	((keystroke)same(dynamics or latenc\$4 or pace))(password or PIN)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 18:07
L3	3060	(713/182,183,186,187).CCLS.	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	OFF	2008/02/05 18:07
L4	31	L2 L3	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 18:07
L5	40	L1 or L4	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 18:07
L6	33	("3993976" "4197524" "4455588" "4621334").PN. OR ("4805222").URPN.	US-PGPUB; USPAT; USOCR	AND	ON	2008/02/05 18:14
L7	40	("4410957" "4621334" "4805222" "4937778" "4962530" "4998279" "5040134" "5048100" "5056141" "5113483" "5131054").PN. OR ("5557686").URPN.	US-PGPUB; USPAT; USOCR	AND	ON	2008/02/05 18:14
L8	10	("4805222" "5210820" "5557686" "5910989" "6038315" "6317834" "6442692").PN. OR ("6895514").URPN.	US-PGPUB; USPAT; USOCR	AND	ON	2008/02/05 18:15
L9	0	("2006/0242424").URPN.	USPAT	AND	ON	2008/02/05 18:15
L10	0	("2005/0193208").URPN.	USPAT	AND	ON	2008/02/05 18:15
L11	67	L6 or L7 or L8	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 18:16
L12	6	"6912605".pn. "6954862".pn. "6442692".pn. "6895514".pn. "20040059950"	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2008/02/05 18:17

EAST Search History

L13	70	L11 or L12	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	ON	2008/02/05 18:17
L15	5	L13 (absolute)(keystroke)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 18:18

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	355	((interval or time)same(between or elapsed)same(two or second)same(keystroke or character or input))(password).clm.	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:28
L2	38	L1 (keystroke or rythm or pace)(absolute or relative or ratio)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:29
L3	45	L1 (keystroke or rythm or pace)(absolute or relative or ratio or average or mean)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:30
L4	18	L3(keystroke or rythm or pace or anchor or absolute or relative or ratio or average or mean divided).clm.	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:30
L5	777	(keystroke or rythm or pace)(absolute)(relative or ratio)(password)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:35
L6	187	L5((interval or time)same(between or elapsed)same(two or second)same(keystroke or character or input))(password)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:35
L7	182	L6 (relative or anchor)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:36
L8	4	L7 ((keystroke or password)(absolute or relative)(second or two)).clm.	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:37
L9	163083	((keystroke or password or value)same(absolute or relative)same(second or two))	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:40
L10	23388	((keystroke or password or value)same(absolute or relative)same(second or two)same(divided or ratio))	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:40
L11	76	L10((interval or time or difference or divided)same(between or elapsed or ratio)same(two or second)same(keystroke or character or input))(password)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:42

EAST Search History

L12	71	L10((interval or time or difference)same(between or elapsed or ratio or divided)same(two or second)same(keystroke or character or input))(password)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:42
L13	82	L11 or L12	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:42
L14	71	L13(absolute or divided)(relative or anchor)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:43
L15	28	L14 (keystroke or password or absolute or relative).clm.	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:44
L16	50	(keystroke)same(absolute)(relative)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:51
L17	1437	(713/182).CCLS.	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	OFF	2008/02/05 16:52
L18	3060	(713/182,183,186,187).CCLS.	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	OR	OFF	2008/02/05 16:53
L19	46	L18((keystroke or entry or character or input)same(absolute or ratio))((keystroke or entry or character or input)same(relative or divided or ratio))	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:54
L20	40	L19 (password or keystroke or authenticat\$4)	US-PGPUB; USPAT; EPO; JPO; IBM_TDB	AND	ON	2008/02/05 16:55



USPTO

[Subscribe](#) (Full Service) [Register](#) (Limited Service, Free) [Login](#)Search: ☐ The ACM Digital Library ☒ The Guide

THE GUIDE TO COMPUTING LITERATURE

[Feedback](#)

Identity authentication based on keystroke latencies

Full text Pdf (823 KB)

Source **Communications of the ACM** [archive](#)
Volume 33 , Issue 2 (February 1990) [table of contents](#)
Pages: 168 - 176
Year of Publication: 1990
ISSN:0001-0782

Authors [Rick Joyce](#) AT&T Bell Labs, Middletown, NJ
[Gopal Gupta](#) James Cook Univ., Townsville, Australia

Publisher [ACM](#) New York, NY, USAAdditional Information: [abstract](#) [references](#) [cited by](#) [index terms](#) [review](#) [collaborative colleagues](#) [peer to peer](#)

Tools and Actions: [Review this Article](#)
[Save this Article to a Binder](#) Display Formats: [BibTex](#) [EndNote](#) [ACM Ref](#)

DOI Bookmark: Use this link to bookmark this Article: <http://doi.acm.org/10.1145/75577.75582>
[What is a DOI?](#)

↑ ABSTRACT

The variables that help make a handwritten signature a unique human identifier also provide a unique digital signature in the form of a stream of latency periods between keystrokes. This article describes a method of verifying the identity of a user based on such a digital signature, and reports results from trial usage of the system.

↑ REFERENCES

Note: OCR errors may be found in this Reference List extracted from the full text article. ACM has opted to expose the complete List rather than only correct and linked references.

- 1 [Stuart K. Card , Thomas P. Moran , Allen Newell, The keystroke-level model for user performance time with interactive systems, Communications of the ACM, v.23 n.7, p.396-410, July 1980 \[doi>10.1145/358886.358895\]](#)
- 2 Gaines, R., Lisowski, W., Press, S., and Shapiro, N. Authentication by user performance time with interactive systems. commun. ACM NSF. Rand Corporation, Santa Monica, CA, 1980.
- 3 Garcia, J. Personal identification apparatus. Patent Number 4,621,334. U.S. Patent and Trademark Office. Washington. D.C.. 1986.
- 4 Joyce, R., and Gupta, G. User authentication based on keystroke latencies. Technical Report #5, Department of Computer Science, James Cook University, Australia, 1989.

[Home](#) | [Login](#) | [Logout](#) | [Access Information](#) | [Alerts](#) | [Purchase History](#) |

Welcome United States Patent and Trademark Office

[Search Results](#)[BROWSE](#)[SEARCH](#)[IEEE XPLORE GUIDE](#)Results for "((**keystroke**)<in>metadata) <and> ((latancies or absolute)<in>metadata))<and> ((

Your search matched 0 of 1741857 documents.

A maximum of 100 results are displayed, 25 to a page, sorted by Relevance in Descending order.

» [Search Options](#)[View Session History](#)[New Search](#)» [Key](#)

IEEE JNL	IEEE Journal or Magazine
IET JNL	IET Journal or Magazine
IEEE CNF	IEEE Conference Proceeding
IET CNF	IET Conference Proceeding
IEEE STD	IEEE Standard

Modify Search

☐ Check to search only within this results setDisplay Format: ☒ Citation ☐ Citation & Abstract[IEEE/IET](#)[Books](#)[Educational Courses](#)[A](#)

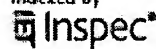
IEEE/IET journals, transactions, letters, magazines, conference proceedings, and

[Select All](#) [Deselect All](#)

No results were found.

Please edit your search criteria and try again. Refer to the Help pages if you need assistance.

Indexed by

[Help](#) [Contact Us](#)

© Copyright 2008


[Web](#) [Images](#) [Video](#) [News](#) [Maps](#) [more »](#)

[Advanced Scholar Search](#)
[Scholar Preferences](#)
[Scholar Help](#)
Scholar [All articles](#) - [Recent articles](#) Results 1 - 10 of about 74 for **joyce gupta keystroke absolute**
All Results
[F Monroe](#)
[A Rubin](#)
[M Obaidat](#)
[B Sadoun](#)
[F Bergadano](#)

[PDF] [Keystroke dynamics as a biometric for authentication - all 7 versions »](#)

F Monroe, AD Rubin - FUTURE GENER COMPUT SYST, 2000 - cs.columbia.edu

... showing plots of the covariance matrices (of the **keystroke** latencies for ... these **absolute** verification rates are en- couraging, **Joyce** and **Gupta** tested using ...

[Cited by 78](#) - [Related Articles](#) - [View as HTML](#) - [Web Search](#)

[Authentication via **keystroke** dynamics - all 8 versions »](#)

F Monroe, A Rubin - Proceedings of the 4th ACM conference on Computer and ..., 1997 - portal.acm.org

... [GLPNOS], Leggett et al.pW85] WSS][LUS9], Bleha [BSHSO], and **Joyce** and **Gupta** [JG90].

Examine the use of **keystroke** durations (ie, length of time keys are ...

[Cited by 80](#) - [Related Articles](#) - [Web Search](#)

[PDF] [Keystroke Dynamics Verification Using a Spontaneously Generated Password - all 2 versions »](#)

S Modi, SJ Elliott - Carnahan Conferences Security Technology, Proceedings 2006 ..., 2006 - biotown.purdue.edu

... According to **Joyce** and **Gupta**, "Digital signatures ... The shape of the typing pattern is defined as the difference in successive **keystroke** latencies and ...

[View as HTML](#) - [Web Search](#)

[Verification of computer users using **keystroke** dynamics - all 3 versions »](#)

MS Obaidat, B Sadoun - Systems, Man and Cybernetics, Part B, IEEE Transactions on, 1997 - ieeexplore.ieee.org

... **Joyce** and **Gupta** [9] have described an ... Leggett and Williams [10] have studied the use of **keystroke** characteristics in verifying identity of a person: ...

[Cited by 90](#) - [Related Articles](#) - [Web Search](#)

[PDF] [Enhanced User Authentication Through **Keystroke** Biometrics - all 3 versions »](#)

E Lau, X Liu, C Xiao, X Yu - Final Project Report. Massachusetts Institute of Technology. ..., 2004 - mit.edu

... Models such as those used by D'Souza [3], Ke [1], and **Joyce** and **Gupta** [4] all develop a ... We call such a metric a metric for **relative keystroke** speeds. ...

[Related Articles](#) - [View as HTML](#) - [Web Search](#)

[User authentication through **keystroke** dynamics - all 4 versions »](#)

F Bergadano, D Gunetti, C Picardi - ACM Transactions on Information and System Security (TISSEC), 2002 - portal.acm.org

... Experiments found in the literature (eg, in Umphress and Williams [1985], **Joyce** and **Gupta** [1990], Brown and ... User Authentication through **Keystroke** Dynamics ...

[Cited by 50](#) - [Related Articles](#) - [Web Search](#)

[PDF] [Keystroke Dynamics as a Biometric for Authentication - all 7 versions »](#)

NJ Florham Park - bell-labs.com

... The users **keystroke** latencies, as well as **keystroke** durations, are ... Although these



USPTO

[Subscribe \(Full Service\)](#) [Register \(Limited Service, Free\)](#) [Login](#)Search: ☐ The ACM Digital Library ☒ The Guide

THE GUIDE TO COMPUTING LITERATURE

[Feedback](#)

User authentication through keystroke dynamics

Full text [Pdf \(351 KB\)](#)Source **ACM Transactions on Information and System Security (TISSEC)** [archive](#)Volume 5, Issue 4 (November 2002) [table of contents](#)

Pages: 367 - 397

Year of Publication: 2002

ISSN:1094-9224

Authors [Francesco Bergadano](#) University of Torino, Torino, Italy[Daniele Gunetti](#) University of Torino, Torino, Italy[Claudia Picardi](#) University of Torino, Torino, ItalyPublisher [ACM](#) New York, NY, USAAdditional Information: [abstract](#) [references](#) [cited by](#) [index terms](#) [review](#) [collaborative colleagues](#) [peer to peer](#)

Tools and Actions:

[Review this Article](#)[Save this Article to a Binder](#)Display Formats: [BibTex](#) [EndNote](#) [ACM Ref](#)

DOI Bookmark:

Use this link to bookmark this Article: <http://doi.acm.org/10.1145/581271.581272>[What is a DOI?](#)

↑ ABSTRACT

Unlike other access control systems based on biometric features, keystroke analysis has not led to techniques providing an acceptable level of accuracy. The reason is probably the intrinsic variability of typing dynamics, versus other---very stable---biometric characteristics, such as face or fingerprint patterns. In this paper we present an original measure for keystroke dynamics that limits the instability of this biometric feature. We have tested our approach on 154 individuals, achieving a False Alarm Rate of about 4&percent; and an Impostor Pass Rate of less than 0.01&percent;. This performance is reached using the same sampling text for all the individuals, allowing typing errors, without any specific tailoring of the authentication system with respect to the available set of typing samples and users, and collecting the samples over a 28.8-Kbaud remote modem connection.

↑ REFERENCES

Note: OCR errors may be found in this Reference List extracted from the full text article. ACM has opted to expose the complete List rather than only correct and linked references.

- 1 [Julian Ashbourn, Biometrics: advanced identity verification, Springer-Verlag, London, 2000](#)
- 2 Ashbourn, J. 2000b. The distinction between authentication and identification. Paper available at the Avanti Biometric Reference Site. (homepage.ntlworld.com/avanti)
- 3 Axelsson, S. 2000a. Intrusion detection systems: A taxonomy and survey. Tech. Rep: 99-15. Dept. Computer Engineering, Chalmers University of Technology, Sweden, March.


[Web](#) [Images](#) [Video](#) [News](#) [Maps](#) [more »](#)

absolute relative keystroke two OR second

1996

- 2002

Search

Ad
Sc
Sc

Scholar All articles - **Recent articles** Results 1 - 10 of about 1,430 for **absolute relative keystroke t**

All Results[D Kieras](#)[J Laszlo](#)[F Monroe](#)[D Meyer](#)[D Donoho](#)

[BOOK] A Universal Logging Format for Augmentative Communication - all 6 versions »

GW Lesh, Educational Resources Information ... - 2000 - irit.fr

... The timestamp may be **absolute**, **relative** to the start of the logfile, or **relative** to the ... well as estimates of communication rate and **keystroke** efficiency. ...

[Cited by 7](#) - [Related Articles](#) - [View as HTML](#) - [Web Search](#) - [Library Search](#)

Interactive control for physically-based animation - all 14 versions »

J Laszlo, M van de Panne, E Fiume - Proceedings of the 27th annual conference on Computer ..., 2000 - portal.acm.org

... long made extensive use of **keystrokes** for motion ... set joint position (**absolute**) Sets desired position of ... adjust joint position (**relative**) Changes the desired ...

[Cited by 64](#) - [Related Articles](#) - [Web Search](#)

Evaluation of Prediction Methods Applied to an Inflected Language - all 5 versions »

N Garay-Vitoria, J Abascal, L Gardezabal - Text, Speech, and Dialogue: 5th International Conference, ..., 2002 - books.google.com

... of **keystrokes** - # of written **keystrokes** total# of **keystrokes** (1) The ... the first between 5.83% and 11.08% in **absolute** values (28.24%-35.89% in **relative** values ...

[Cited by 1](#) - [Related Articles](#) - [Web Search](#)

[PDF] Using the Keystroke-Level Model to Estimate Execution Times - all 13 versions »

D Kieras - University of Michigan, 2001 - cit.gu.edu.au

... Pressing the SHIFT or CONTROL key counts as a separate **keystroke**. ... of the alternative

designs, and so affects only the **absolute**, not the **relative**, task times ...

[Cited by 14](#) - [Related Articles](#) - [View as HTML](#) - [Web Search](#)

Keyboard Reaction Force and Finger Flexor Electromyograms during Computer Keyboard Work. - all 5 versions »

BJ Martin, TJ Armstrong, JA Foulke, S Natarajan, E ... - Human Factors, 1996 - questia.com

... that women exert twice as much **relative** effort as ... As expected, the highest **absolute** force was exerted by ... the reaction force varies from one **keystroke** to another ...

[Cited by 25](#) - [Related Articles](#) - [Web Search](#)

Theoretical and architectural support for input device adaptation - all 8 versions »

J Wang, J Mankoff - Proceedings of the 2003 conference on Universal usability, 2002 - portal.acm.org

... of the amount of information carried in each **keystroke**. ... a device is rotated or pressed and **relative** vs. **absolute** positioning [6]. However, that work could not ...

[Cited by 6](#) - [Related Articles](#) - [Web Search](#)

[PDF] Keystroke dynamics as a biometric for authentication - all 7 versions »

F Monroe, AD Rubin - FUTURE GENER COMPUT SYST, 2000 - cs.columbia.edu